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I HEREBY CERTIFY THAT THIS IS A TRUE AND CORRECT COPY OF ONE OF THE CONTRACT DRAWINGS EXISTING AT THE TIME THE SAID CONTRACT WAS EXECUTED BY THE PARTIES.
DATE: 11/16/98 *Signature*
DATE: 4/10/98 *Signature*
ENGINEER DESIGNED

12/12/97 ADDED F.D. NOTES
11/17/97 ISSUED FOR BID

No. Date Revision Approval
Engineering Department
Design Division

The
World
Trade
Center
STANDBY POWER
5 WORLD TRADE CENTER
MECHANICAL
SYMBOLS AND
GENERAL NOTES

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Date 11/17/97 Scale NONE
Contract Number Drawing Number

WTC-845.071 **MO-01**
ABBREVIATIONS

AD	ACCESS DOOR
AF	ABOVE FINISHED FLOOR
AL	ACOUSTICAL LINING
BO	BLANK OFF
BR	BOTTOM REGISTER
BTU	BRITISH THERMAL UNIT
CFM	CUBIC FEET PER MINUTE
DN	DOWN
FC	FLEXIBLE CONNECTION
FG	FLOOR GRILLE
FT	FEET
GPM	GALLONS PER MINUTE
MBH	THOUSAND BTU PER HOUR
NC	NOT IN THIS CONTRACT
NTS	NOT TO SCALE
OA	OUTSIDE AIR INTAKE
UH	UNIT HEATER
RPM	REVOLUTION PER MINUTE
SA	SOUND ATTENUATOR
SM	SHEET METAL
WMS	WIRE MESH SCREEN

PIPING SYMBOLS

---	EXISTING PIPE TO REMAIN
----	EXISTING PIPE TO BE REMOVED
---	ANCHOR
---	FUEL OIL GAUGE LINE
---	FUEL OIL RETURN
---	FUEL OIL FILL
---	FUEL OIL SUPPLY
---	FUEL OIL VENT LINE
---	LOW PRESSURE CONDENSATE RETURN
---	LOW PRESSURE STEAM
---	FUEL FILTRATION SUPPLY
---	FUEL FILTRATION RETURN
---	FLOAT AND THERMOSTATIC STEAM TRAP
---	ARROW INDICATES DIRECTION OF FLOW
---	PIPE GUIDE
---	UNION
---	PIPE UP
---	PIPE DOWN
---	DIRT LEG
---	T-Y TYPE STRAINER WITH BLOW OFF VALVE
---	PITCH PIPE IN DIRECTION OF ARROW
---	LOW PRESSURE DRIP TRAP ASSEMBLY

VALVES AND GAUGES

---	CLOSE VALVE
---	GATE VALVE
---	CHECK VALVE
---	AUTOMATIC TWO WAY CONTROL VALVE
---	ELECTRIC CONTROL VALVE
---	RELIEF VALVE
---	PRESSURE OR VACUUM GAUGE WITH COCK
---	DUPLEX STRAINER
---	THERMOSTAT, PNEUMATIC
---	LOW PRESSURE TRAP RIG
---	BALL VALVES
---	CONSERVATION FLOAT AND THERMOSTATIC TRAP
---	BLOCK VENT
---	FUSIBLE LINK FIRE SHUTOFF VALVE

SHEETMETAL SYMBOLS

---	SUPPLY DUCT UNDER POSITIVE PRESSURE
---	SUPPLY DUCT NEGATIVE POSITIVE PRESSURE
---	ACCESS DOOR IN DUCT
---	SMOKE DETECTOR HEAD IN DUCT
---	DUCT SIZE (FIRST SIZE INDICATES PLAN SIZE)
---	DUCT FLEXIBLE CONNECTION
---	MOTORIZED DAMPER
---	ACOUSTIC LINING DUCTWORK
---	SQUARE FEET

MECHANICAL
A. GENERAL NOTES

1. THE CONTRACTOR SHALL BE RESPONSIBLE TO PERFORM ALL WORK NECESSARY TO FURNISH, OFFLOAD, STORE, STAGE, REMOVE AND INSTALL EQUIPMENT APPURTENANCES, MATERIALS AND SERVICES TO MAKE INSTALLATION COMPLETE, FUNCTIONAL AND OPERABLE TO THE SATISFACTION OF THE ENGINEER.
2. AS PART OF THIS CONTRACT, THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE INSTALLATION OF CERTAIN EQUIPMENT, APPURTENANCES AND MATERIALS WHICH WILL BE FURNISHED BY THE PORT AUTHORITY (PA). AS DELINEATED ON THESE CONTRACT DOCUMENTS, THE CONTRACTOR SHALL INSTALL ALL EQUIPMENT, VALVES, ACTUATORS, CONTROL WIRING, CONTROL DEVICES, RACKS, SUPPORTS, VIBRATION ISOLATORS, ETC. AS PER THE RECOMMENDATIONS/REQUIREMENTS OF THE ENGINEER.
3. THE CONTRACTOR SHALL INCORPORATE ALL PERTINENT INFORMATION OF THE PA FURNISHED EQUIPMENT IN HIS SHOP DRAWINGS AND SUBMIT TO THE ENGINEER FOR APPROVAL. SUCH INFORMATION SHALL INCLUDE BUT NOT BE LIMITED TO THE DIMENSIONS, LOCATIONS, CONNECTIONS, INSTALLATION DETAILS, FUNCTIONS, CONTROLS, ELECTRICAL WIRING AND POWER REQUIREMENTS FOR EACH PIECE OF EQUIPMENT WIRING TERMINATIONS.
4. THE CONTRACTOR SHALL COORDINATE WITH THE VENDORS OF THE PA FURNISHED EQUIPMENT FOR THE PURPOSE OF DELIVERY, SCHEDULING AND PROPER HANDLING AND INSTALLATION. THE CONTRACTOR SHALL BE RESPONSIBLE TO ACQUIRE THE NECESSARY TECHNICAL SUPPORT FROM THE APPLICABLE MANUFACTURERS TO ENSURE PROPER INSTALLATION, TO SATISFY THE OPERATIONAL AND FUNCTIONAL REQUIREMENTS OF ALL EQUIPMENT AND COMPONENTS INSTALLED BY HIM UNDER THIS CONTRACT.
5. THE CONTRACTOR SHALL INSPECT, AND IF ACCEPTABLE, APPROVE ALL EQUIPMENT AND MATERIALS PROVIDED BY THE PA PRIOR TO HANDLING, STORAGE AND INSTALLING.
6. REFER TO THE CONTRACT SPECIFICATIONS FOR THE LIST OF REFERENCE DOCUMENTS PERTAINING TO THE PERFORMED UNDER THIS CONTRACT, INCLUDING THE APPURTENANCES AND MATERIALS FURNISHED BY THE PA.
7. THE CONTRACTOR SHALL ASSUME ALL RESPONSIBILITIES FOR THE LOSS OR DAMAGE OF ANY OF THE PA FURNISHED EQUIPMENT DUE TO HIS NEGLIGENCE. THE CONTRACTOR SHALL REPAIR OR REPLACE SUCH EQUIPMENT TO THE SATISFACTION OF THE ENGINEER, PLUS LOCATED DAMAGES FOR ANY DELAY TO THE CONTRACT SCHEDULE RESULTED FROM THE LOSS OF DAMAGE.
8. THE CONTRACTOR SHALL SUBMIT DETAILED CONSTRUCTION PHASING PLAN PRIOR TO STARTING THE WORK TO BE PERFORMED UNDER THIS CONTRACT, INCLUDING THE METHODOLOGY FOR THE REMOVAL OF MATERIAL AND EQUIPMENT. SUCH PLAN SHALL DETAIL ALL TEMPORARY STRUCTURES AND EQUIPMENT NECESSARY FOR THE PROPER HANDLING OF THE MATERIAL AND EQUIPMENT WITH THE RISK OF DAMAGING ANY STRUCTURE, EQUIPMENT OR PERSONNEL.
9. THE CONTRACTOR SHALL PROVIDE ALL PIPE HANGERS AND EQUIPMENT SUPPORTS TO COMPLY WITH SEISMIC RESTRAINTS REQUIRED BY LOCAL LAW 1793.
10. ALL MECHANICAL AND ELECTRICAL WORK SHALL BE FREE FROM DEFECTS IN WORKMANSHIP AND MATERIALS FOR A PERIOD OF ONE YEAR FROM DATE OF FINAL ACCEPTANCE AND SHALL MEET ALL LOCAL CODES AS STATED BELOW. ALL DEFECTS, WHICH DEVELOP OR ARE DISCOVERED WITHIN THIS PERIOD SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE ARCHITECT OR OWNER AT NO ADDITIONAL COST. UPON COMPLETION OF THE WORK UNDER THIS CONTRACT, THE CONTRACTOR SHALL REMOVE ALL APPURTENANCES, SURPLUS MATERIAL AND SCRAP LEAVING THIS WORK IN PERFECT CONDITION.

B. NOTICE TO BIDDERS

1. THE SPECIFICATIONS AND DRAWINGS ARE INTENDED TO SERVE JOINTLY AS A BASIS UPON WHICH THE CONTRACTOR SHALL SUBMIT A CONTRACT PRICE FOR THE MATERIAL AND LABOR PROVISIONS.
2. WHEN CONFLICTS OCCUR IN THE SPECIFICATIONS OR ON THE DRAWINGS, OR BETWEEN EITHER, THE ITEMS GREATER QUANTITY OR HIGHER COST SHALL BE PROVIDED.
3. THE CONTRACTOR SHALL PROVIDE ALL ITEMS OF LABOR OR MATERIALS SPECIFICALLY INDICATED, OR REQUIRED TO COMPLETE THE INTENDED INSTALLATIONS.
4. THE CONTRACTOR SHALL COORDINATE HIS WORK IN ORDER THAT CONFLICTS IN SPACE LOCATIONS DO NOT OCCUR.
5. THIS CONTRACTOR SHALL BE RESPONSIBLE FOR THIS WORK WITH ITS COMPLETION AND FINAL ACCEPTANCE, AND SHALL REPLACE ANY DAMAGED, LOST OR STOLEN ITEMS WITH IDENTICAL REPLACEMENTS, WITHOUT ADDITIONAL COST TO THE OWNER.
6. ALL WORK IN OCCUPIED TENANT AREAS SHALL BE PERFORMED ON OTHER THAN NORMAL WORKING HOURS OR SCHEDULED AS DIRECTED BY THE OWNER.
7. THE CONTRACTOR SHALL NOTIFY THE OWNER WHEN SHUTDOWN OF EXISTING SYSTEMS BECOMES NECESSARY. SHUTDOWN TIME SHALL BE KEPT TO A MINIMUM.
8. THE CONTRACTOR WILL BE HELD TO HAVE VISITED THE SITE AND EXAMINED THE DRAWINGS AND SPECIFICATIONS OF OTHER TRADES AND OF GENERAL CONSTRUCTION TRADES TO SATISFY HIMSELF OF ALL CONDITIONS INVOLVED. THE CONTRACTOR SHALL VERIFY ALL MEASUREMENTS GIVEN ON THE DRAWINGS AND PHOTOGRAPHICALLY ACCURATE WITH ALL EXISTING CONDITIONS AFFECTING THE PROPER INSTALLATION OF HIS WORK.
9. THE WORK UNDER THIS CONTRACT SHALL BE PERFORMED AND COORDINATED SIMULTANEOUSLY WITH WORK OF OTHER TRADES SO AS NOT TO DELAY THE OVERALL PROGRESS OF WORK.

C. SHOP DRAWING & EQUIPMENT SUBMITTALS

1. ONE SET OF SEPARATE SHOP DRAWINGS, LAYOUT AND CERTIFIED EQUIPMENT MANUFACTURER'S DATA SHALL BE SUBMITTED FOR APPROVAL TO THE ENGINEER PRIOR TO ORDER OR PURCHASE. SUBMIT THREE SETS OF DRAWINGS FOR HIS/HER ACCESSORIES, ETC.
2. COORDINATE WITH THE WORK OF OTHER TRADES.
3. AIR BALANCING AND TESTING. SUBMIT REPORT AS SPECIFIED.
4. SHOP DRAWINGS SHALL BE 3/8"=1'-0" SCALE.
5. SUBMIT AIR HANDLER UNIT HANGING DETAILS.

D. RECORD DRAWINGS

1. A REPRODUCIBLE RECORD DRAWING SHALL BE SUPPLIED UPON WHICH CORRECTIONS HAVE BEEN MADE TO PROVIDE AN ACCURATE AND COMPLETE RECORD OF THE WORK AS INSTALLED. A REPRODUCIBLE COPY OF THIS DRAWING SHALL BE PROVIDED TO THE OWNER ONCE THE INSTALLATION IS COMPLETE.

E. CODES, PERMITS AND INSPECTION

1. ALL WORK SHALL MEET OR EXCEED THE LATEST REQUIREMENT OF THE NEW YORK CITY BUILDING CODE, NATIONAL ELECTRICAL CODE, THE NFPA AND OTHER AUTHORITIES EXERCISING JURISDICTION OF THE WORK OF THIS PROJECT.
2. COMPLY WITH APPLICABLE UTILITY COMPANY RULES AND REGULATIONS.
3. COMPLY WITH OCCUPATIONS SAFETY AND HEALTH ACT (OSHA) REQUIREMENTS.
4. SECURE AND PAY FOR ALL REQUIRED PERMITS, INSPECTION CERTIFICATES AND TRANSMIT SAME TO THE OWNER AT THE COMPLETION OF THE WORK.

F. GUARANTEES

1. ALL WORK SHALL BE GUARANTEED TO BE FREE FROM LEAKS OR OTHER DEFECTS. ALL DEFECTIVE MATERIAL OR WORKMANSHIP AS WELL AS DAMAGES TO THE WORK SHALL BE REPLACED AND REPAIRED. ALL TRADES RESULTING FROM SAID SHALL BE REPLACED OR REPAIRED FOR THE DURATION OF THE GUARANTEE PERIOD.
2. THE GUARANTEE PERIOD SHALL BE FOR ONE (1) YEAR FROM DATE OF ACCEPTANCE, WHICH SHALL BE THE DATE OF FINAL PAYMENT OR THE DATE OF FORMAL NOTICE OF ACCEPTANCE, WHICHEVER IS EARLIER.
3. CERTIFICATION SHALL BE FOR ONE (1) YEAR FROM THE DATE OF ACCEPTANCE, WHICH SHALL BE THE DATE OF FINAL PAYMENT OR THE DATE OF FORMAL NOTICE OF ACCEPTANCE, WHICHEVER IS EARLIER.

G. REMOVALS AND ALTERATIONS

1. THE CONTRACTOR SHALL REMOVE, RELOCATE, REPLACE, ADJUST, ADAPT AND MODIFY EXISTING EQUIPMENT AND/OR SYSTEMS AS REQUIRED BY THE DRAWINGS OR SPECIFICATION, AND AS MAY BE REQUIRED WHEN THE COMPLETION OF WORK IN THE CONTRACT OR OTHER CONTRACT WORK.
2. ALL REMOVED EQUIPMENT AND MATERIAL SHALL BE REMOVED FROM THE PROJECT SITE.

H. WORK INCLUDE UNDER OTHER SECTIONS OF WORK

1. ITEMS OF WORK WHICH SHALL BE INCLUDED UNDER OTHER SECTIONS OF WORK ARE AS FOLLOWS:
 - a. ELECTRICAL WIRING FOR POWER.
 - b. PROVISION OF ELECTRICAL DISCONNECT SWITCHES OR FUSES (UNLESS FURNISHED INTEGRALLY WITH EQUIPMENT).

I. FUEL HANDLING SYSTEMS

1. DESCRIPTION:
 - a. PROVIDE FUEL OIL HANDLING SYSTEMS IN ACCORDANCE WITH THE CONTRACT.
2. WORK INCLUDED:
 - a. FIELD FABRICATED FUEL OIL RECTANGULAR STORAGE TANKS.
 - b. FUEL OIL MANAGEMENT SYSTEM AND LEVEL CONTROL CENTER.
 - c. MAIN TANK GAUGE AND LEAK MONITORING SYSTEM.
 - d. FUEL OIL PUMPING AND STRAINING SET.
 - e. FILTRATION, DETERAVENTING AND FUEL STABILIZATION SYSTEM.
 - f. 18" HEADER SYSTEM.
 - g. FUEL OIL SPECIALTIES.
 - h. PIPING, VALVES AND ACCESSORIES, SPECIFICATION SECTION 15503.
 - i. UNDERGROUND PIPING SPECIFICATION SECTION 15503.
3. SUBMITTALS:
 - a. SUBMIT FULL TECHNICAL RATING DATA, CATALOG CUTS, MODEL NUMBERS, DIMENSIONAL INSTALLATION DETAILS, CAPACITIES, CONSTRUCTION DETAILS, PIPING DETAILS, WIRING DIAGRAMS AND INSTALLATION INSTRUCTIONS.
 - b. SUBMIT SHOP DRAWINGS OF THE FIELD FABRICATED TANK FOR APPROVAL. THE SHOP DRAWINGS SHALL INDICATE THE SIZE, CONSTRUCTION DATA, REINFORCEMENT DETAILS, LUGGING INSTALLATION, ALL DETAILS OF ANGLE IRON BRACKETS AND DETAILING, LOCATE ALL WELD JOINTS, TAPPING CONNECTION AND LOCATION OF THE TAPPINGS.
 - c. SYSTEM VENDOR SHALL COORDINATE PRODUCT DATA PRESENTED BY LEAK MONITORING SYSTEM AND FUEL MANAGEMENT SYSTEM. NO FIELD FABRICATED TANKS TO PROVIDE A COMPREHENSIVE SET OF INTERIOR DRAWINGS WHICH WILL SERVE AS THE BASIS FOR SYSTEM EVALUATION BY THE ENGINEER AND INSTALLATION BY MECHANICAL CONTRACTOR DESIGNATED BY THE OWNER.

J. PRODUCTS

1. FIELD FABRICATED FUEL OIL RECTANGULAR STORAGE TANKS
 - a. PROVIDE FUEL OIL STORAGE TANKS OF SIZE AND CAPACITY AS INDICATED ON THE PLANS. TANKS SHALL BE OF RECTANGULAR CONSTRUCTION AND SHALL BE PROVIDED WITH A 2" DIA. DRIVEN MANHOLE IN THE TOP. TANKS SHALL BE PROVIDED WITH PIPES TAPPINGS FOR FILL, RELIEF, VENT, RETURN, SUPPLY TO TRANSFER PUMPS, GROUND OVERFILL ALARM, AND TWO (2) 2" SPARES. TANKS SHALL BE CONSTRUCTED OF 5/16" THICK WELDED PLATE STEEL. CORNERS MAY BE MADE UP BY BENDING PLATES OR BY USING ANGLES. MINIMUM RIVET DIAMETER IN SEAMS SHALL BE 5/8" AND RIVETS SHALL BE OF THE SAME MATERIAL AS THE TANK. ALL STRUCTURAL MEMBERS SHALL BE BRACED BY STRUCTURAL MEMBERS. EXCEED 30 INCHES.
 - b. PAINT EXTERIOR OF TANKS WITH 1 COAT OF BITUMASTIC.
 - c. PROVIDE STEEL LADDERS INSIDE AND OUT FOR EACH RECTANGULAR TANK.
 - d. MANHOLE COVER TO BE PROVIDED WITH BRASS BOLTS AND METALLIC GASKETS.
 - e. ALL OPENINGS SHALL BE THROUGH THE TOP OF THE TANKS.
 - f. PROVIDE ANGLE BRACKETS WELDED TO SIDES OF THE TANK TO ANCHOR THE TANKS TO THE CURB. PROVIDE AND COORDINATE THE ANCHOR DETAILS WITH THE CONCRETE SUBCONTRACTOR.
 - g. RECTANGULAR TANKS TO BE BUILT IN COMPLIANCE WITH NEW YORK CITY BUILDING CODE REGULATIONS.
 - h. HYDROSTAT TANKS TO 25 PSI FOR A ONE-HOUR DURATION AND WITNESSED BY THE ENGINEER AND P.A. REPRESENTATIVE.
2. SUBMIT SHOP DRAWINGS OF THE TANK FOR APPROVAL. THE SHOP DRAWINGS SHALL INDICATE THE SIZE, CONSTRUCTION DATA, TAPPING CONNECTIONS AND LOCATION OF THE TAPPINGS.
3. PROVIDE FABRICATOR'S WARRANTY FOR ONE (1) YEAR FROM DATE OF OWNER'S ACCEPTANCE OF FUEL OIL SYSTEM, AGAINST FAULTY MATERIAL OR WORKMANSHIP.

2. FUEL OIL SPECIALTIES

- a. FILL LINE: STORAGE TANK FILL LINE SHALL TERMINATE IN A GALVANIZED, CAST IRON FILL BOX WITH THREADED BRASS CAP AND OIL TREATED GASKET TO MAKE IT WATERTIGHT. BOX SHALL BE FULL SIZE OF THE PIPE. FILL BOX SHALL BE PROTECTED AT GRADE WITH A WATERPROOF STREET BOX. FILL BOX AND STREET BOX SHALL BE EQUAL TO PREFERRED UTILITIES MFG. CORP. TYPE "W" AND TYPE 1284 RESPECTIVELY.
 - b. VENT LINE: THE VENT LINE SHALL TERMINATE AND BE MOUNTED FLUSH IN THE OUTSIDE WALL WHERE SHOWN ON THE PLANS, USING A 3" CAST ALUMINUM VENT BROCK EQUAL TO PREFERRED UTILITIES.
 - c. FOOT VALVE: PROVIDE ON TANK SUCTON SUB A 2" BRONZE, SINGLE POPPET FOOT VALVE WITH LAPPED IN SEAT, AND 20 MESH MOUNTED SCREEN. FOOT VALVE SHALL BE EQUAL TO PREFERRED UTILITIES TYPE "R".
 - d. FILL AND VENT LINES SHALL BE SUFFICIENTLY IDENTIFIED BY ONE-PIECE BRONZE NAME PLATES, APPROXIMATELY 2" X 6" WITH POLISHED RAISED LETTERS AND EQUAL TO PREFERRED UTILITIES MODEL PVP-1.
 - e. PROVIDE LEAK DETECTION SWITCHES EQUAL TO PREFERRED UTILITIES MODEL PSS-WM FOR THE FOLLOWING POINTS: ONE UNIT IN EACH BOTTOM OF VERTICAL WOODSTOCK FUEL OIL RESER TAP AND IN THE BASINS OF THE PUMP SET AND FUEL FILTRATION SET.
 - f. PROVIDE LEAK DETECTION SWITCHES EQUAL TO PREFERRED UTILITIES MODEL HO-A1 LEAK DETECTION SENSOR WITH LEAK DETECTOR TEST MODULE TO MONITOR FLUID BUILDUP IN THE SUMP PIT IN THE TANK ROOM, IN THE TWO SUMP PANS IN THE TANK ROOM AND ON ALL FOUR SIDES OF EACH TANK. EACH MODULE CONNECTS TO THREE (3) LEAK SENSORS.
 - g. PROVIDE LOW LEVEL SWITCH EQUAL TO MONITOR & MILLER MODEL 80 TO MONITOR LOW LEVEL IN THE GENERATOR FUEL OIL HEADER PIPE.
 - h. PROVIDE HIGH LEVEL SWITCH EQUAL TO HERCOT MODEL DWH-321-3 TO MONITOR THE HIGH LEVEL OF FUEL IN THE GENERATOR FUEL OIL TANK.
 - i. PROVIDE HIGH LEVEL SWITCH EQUAL TO PREFERRED UTILITIES MODEL PLS-1 TO MONITOR HIGH LEVEL IN EACH MAIN FUEL OIL STORAGE TANK.
 - j. PROVIDE MOTORIZED BALL VALVES TO ALLOW THE AUTOMATIC OPERATION OF THE FUEL OIL MANAGEMENT SYSTEM AS DESCRIBED HEREIN:
 - a. PROVIDE MOTORIZED BALL VALVES, 2" BODY, TO ALLOW THE AUTOMATIC TANK FILL SELECTION OF EITHER OF THE MAIN TANKS. PROVIDE VALVES FOR EACH OF THE TWO TANKS.
 - b. PROVIDE MOTORIZED BALL VALVES, 2" BODY, TO ALLOW THE MAIN TANK SELECTION FOR THE TANK SUPPLYING THE FUEL OIL TRANSFER PUMP SET. PROVIDE VALVES FOR EACH OF THE TANKS.
 - c. PROVIDE MOTORIZED BALL VALVES, 2" BODY, TO ALLOW THE MAIN TANK SELECTION FOR RETURNING THE FUEL OIL FROM THE SYSTEM. PROVIDE VALVES FOR EACH OF THE TANKS.
 - d. PROVIDE MOTORIZED BALL VALVES, 2" BODY, TO ALLOW THE MAIN TANK SELECTION FOR RETURNING RELIEF OIL FROM THE TRANSFER PUMP SET. PROVIDE VALVES FOR EACH OF THE TANKS.
 - e. PROVIDE MOTORIZED BALL VALVES, 2" BODY, TO ALLOW MAIN TANK SELECTION FOR SUPPLYING FUEL OIL TO THE FUEL FILTRATION PUMP SET. PROVIDE VALVES FOR EACH OF THE TANKS.
 - f. PROVIDE MOTORIZED BALL VALVES, 2" BODY, TO ALLOW MAIN TANK SELECTION FOR RETURNING TREATED OIL TO THE MAIN TANK FROM THE FILTRATION PUMP SET.
 - g. PROVIDE MOTORIZED BALL VALVES, 2" BODY, TO ALLOW MAIN TANK SELECTION FOR RETURNING RELIEF OIL FROM THE FUEL FILTRATION PUMP SET.
 - h. PROVIDE MOTORIZED BALL VALVE, 2" BODY, TO ALLOW THE DRAWING OF THE FUEL OIL HEADER IN CASE OF FIRE CARBON STEEL, 150 # CLASS, BODY, STAINLESS STEEL BALL AND STEM, PTFE SEATS AND STEM SEAL AND FLANGED CONNECTIONS. VALVES SHALL BE WATTS 1501 OR APPROVED EQUAL.
 - i. ELECTRIC ACTUATORS SHALL BE DESIGNED FOR 120 VAC POWER TO OPEN POWER TO CLOSE FOR INTERFERENCE WITH THE MAIN CONTROL SYSTEM. ACTUATORS SHALL BE WATTS 700 OR APPROVED EQUAL.
 - j. PROVIDE FIRE SAFETY SHUTOFF VALVES WITH FUSIBLE LEVER HANDLES ON THE INLET LINES TO THE FUEL OIL TRANSFER PUMP SET, THE FUEL OIL TREATMENT PUMP SET AND ON THE SUPPLY PIPE BEFORE THE HEADER IN THE GENERATOR ROOM.
 - k. PROVIDE A FUEL OIL VENT PROTECTOR, 2" SIZE, ON THE VENT FOR THE HEADER.
 - l. PROVIDE A 2" VACUUM BREAKER IN THE VENT LINE.
3. MAIN TANK GAUGING AND LEAK MONITORING SYSTEM
 - a. PROVIDE AND INSTALL FOR EACH OF THE TWO (2) FUEL OIL STORAGE TANKS A TANK GAUGE AND LEAK MONITORING SYSTEM THAT CONTINUOUSLY INDICATES THE TANK CONTENTS AND MONITORS THE FOLLOWING: LOW LIQUID LEVEL, TANK LEAK (THREE UTILITIES MODEL TO-EL-53-405-N), SYSTEM SHALL BE EQUAL TO PREFERRED UTILITIES.
 - b. FURNISH FOR EACH TANK A LEVEL TRANSDUCER TO INTERFACE WITH THE TANK GAUGE IN THE FUEL MANAGEMENT PANEL. LEVEL TRANSDUCER SHALL BE INTRINSICALLY SAFE, SHALL PROVIDE 0.25 PERCENT RESOLUTION AND SHALL BE FLOAT OPERATED. UNIT SHALL BE SEALED AGAINST TANK PRESSURE. ELECTRONICS SHALL BE SUBMERGED IN A SALESOME OIL FILL. UNIT SHALL ALLOW MECHANICAL TESTING OF HIGH LEVEL SETTING AND CALIBRATION OF GAUGE FROM TOP OF TANK WITHOUT REMOVAL OF UNIT. ASSEMBLY SHALL BE DESIGNED FOR INSTALLATION IN TANK VAULTS WITH AS LITTLE AS 4 INCHES OF HEAD ROOM ABOVE THE TANK. UNIT SHALL USE A MOVING FLAT ON A STAINLESS STEEL EXTENSION WIRE AND SHALL BE EQUAL TO PREFERRED UTILITIES MODEL TO-EL-WP.
 - c. PROVIDE A TOTAL OF ELEVEN (11) LEAK SENSORS FOR MONITORING OF THE MAIN FUEL TANK ROOM FLOOR AROUND THE FOUR (4) SIDES OF THE TANKS, ONE (1) IN THE SUMP PIT AND TWO (2) IN THE SUMP PANS.

- 1) THE LEAK MONITORS SHALL BE SOLID STATE, INTRINSICALLY SAFE, HAVE CONTINUOUS ELECTRONIC CHECKING, FAULT SAFE TO AN ALARM CONDITION AND HAVE INDICATING "WATTS" WITH TEST SWITCHES TO EXERCISE THE SENSORS AND CHECK THE INTRINSICALLY SAFE TEST SWITCHES. TEST SWITCHES THAT BYPASS THE SENSORS OR RELY ONLY ON ELECTRONIC SIMULATION ARE NOT ACCEPTABLE.
- 2) SENSORS SHALL DIFFERENTIATE BETWEEN OIL OR WATER LEAK AND DISPLAY A WATER OR OIL LED ON THEIR INDICATING TRANSMITTERS WHILE SENDING AN APPROPRIATE ALARM SIGNAL TO THE INSTRUMENTS FOR LEAK SENSORS IN TANK VAULT, SUPPLY HARD WIRE PROTECTIVE HOUSING FOR LEAK SENSORS. LEAK SENSORS SHALL BE EQUAL TO PREFERRED UTILITIES MODEL HO-A1.
- 3) THE REMOTE GAUGE INSTRUMENT SHALL BE MICROPROCESSOR BASED, ENCLOSED IN A FLUSH-MOUNTED CAST ALUMINUM HOUSING, PROVIDE A 4-20 MA DC VOLTAGE OUTPUT, CONTINUOUSLY DISPLAY AN 0.8 INCH DIGITAL READOUT IN GALLONS, A PUSH-BUTTON RECALL, A PUSH-BUTTON ALARM TEST AND A PUSH-BUTTON ALARM SILENCE. THE GALLONS AND INCHES CORRELATION SHALL CORRESPOND TO THE TANK MANUFACTURER'S STICK CHART. INSTRUMENT ACCURACY SHALL BE MAINTAINED WITH VOLTAGE FLUCTUATIONS FROM 120 VAC -20% TO +15%.
- 4) EACH ALARM CONDITION SHALL SIGNAL THE INSTRUMENT TO SOUND AN INTEGRAL AUDIBLE ALARM, DISPLAY AN ENGLISH LANGUAGE ALARM DESCRIPTION AND CLOSE DEDICATED SETS OF ALARM CONTACTS AND CONTACTS FOR A REMOTE AUDIBLE ALARM. PUSH-BUTTON ALARM SILENCE SHALL SILENCE THE AUDIBLE ALARMS. ALL VISUAL DISPLAYS REMAIN UNTIL THE ALARM IS CLEARED. THE ALARM CONTACTS (FOR BUILDING AUTOMATION INTERFACE) WILL REMAIN ACTIVATED UNTIL THE SITUATION IS CORRECTED. THE OVERALL ALARM CONTACTS AUTOMATICALLY OPEN IN 60 SECONDS TO SILENCE THE FILL TERMINAL OVERALL ALARM SILENCING STATION.
- 5) A REMOTE ALARM STATION SHALL BE PROVIDED FOR MOUNTING NEAR THE OUTDOOR FILL STATION. THIS ALARM STATION SHALL PROVIDE AUDIBLE AND VISUAL INDICATION OF THE FOLLOWING:
 - 1) MAIN TANK HIGH LEVEL, EACH TANK.
 - 2) FILL VALVE OPEN, EACH TANK.
 - 3) SYSTEM FAL, OR "DO NOT FILL" FLASHING ALARM LIGHT.
- 6) GAUGE INSTALLATION REQUIREMENTS:
 - a. CONTRACTOR MUST ADHERE STRICTLY TO THE MANUFACTURER'S INSTALLATION PROCEDURES. ONE DAY FACTORY START-UP AND CALIBRATION TO BE PROVIDED FOR TANK GAUGING AND LEAK DETECTION SYSTEM BY GAUGE MANUFACTURER.
 - b. A LETTER FROM THE TANK GAUGE AND LEAK DETECTION SYSTEM MANUFACTURER SHALL BE PROVIDED TO THE MECHANICAL ENGINEER STATING THAT THE SYSTEM WAS CHECKED OUT AND CALIBRATED BY A FACTORY TRAINED REPRESENTATIVE AND THAT ALL COMPONENTS ARE IN WORKING ORDER.
 - c. TANK MANUFACTURER'S CERTIFIED TANK PRINT AND STICK CHART MUST BE PROVIDED TO THE TANK GAUGE AND LEAK DETECTION SYSTEM MANUFACTURER AT THE TIME OF ORDER.
 - d. AN OVERALL ALARM SHALL BE PROVIDED. A 10 INCH WEATHERPROOF BELL, AN OVERALL ALARM SIGNAL FROM THE INSTRUMENT SHALL SOUND THE BELL. IF THE FILL OPERATOR DOES NOT MANUALLY SILENCE THE BELL IN ONE MINUTE, IT WILL SILENCE AUTOMATICALLY. THE ALARM STATION SHALL BE EQUAL TO PREFERRED UTILITIES MODEL J4025.
4. FUEL OIL PUMPING AND STRAINING SET
 - a. PROVIDE AND INSTALL A FACTORY ASSEMBLED "PACKAGED" DUPLEX FUEL OIL PUMP SET. THE SET SHALL BE PIPED AND WELDED, WITH COMPONENTS MOUNTED ON A STEEL BASE SUPPORT FABRICATED OF 1/4" STEEL PLATE WITH 4" STEEL SIDE RAILS CONTINUOUSLY WELDED TO THE BASE. BASE SUPPORT TO BE FABRICATED WITH 2-3/4" OVERLAP UP WHICH FORMS A PUMP SET RUPTURE BASIN. IN THE RUPTURE BASIN THROUGH A 3/4" WELDED ON THREADED FEMALE NIPPLE SHALL BE A LEVEL SWITCH FOR LEAK DETECTION. VISUAL AND AUDIBLE ALARM AND ANNUNCIATION FOR THE PUMP SET RUPTURE BASIN SHALL BE LOCATED ON THE PUMP SET CONTROL PANEL. PROVIDE A 1/2" PLUGGED DRAIN CONNECTION IN THE RUPTURE BASIN. ALL WIRING AND PIPING SHALL BE COVERED BY LABELS OF NATIONALLY RECOGNIZED TRADE UNIONS. PIPE SHALL BE SCHEDULE 40 BLACK PIPE WITH SWEATED CONNECTIONS. THE SET SHALL CONSIST OF BUT NOT BE LIMITED TO THE FOLLOWING COMPONENTS:
 - i. EACH PUMP SHALL BE DIRECTLY COUPLED TO A NOT LESS THAN 5 HP, 3450 RPM MOTOR.
 - ii. TWO UNITS SHALL BE CAPABLE OF OPERATING ON 230/460 VOLT, 3 PHASE, 60 HZ ELECTRICAL SERVICE.
 - iii. PROVIDE CONTROLLER TO OPERATE MOTOR DIRECTLY FROM RELAY LOGIC CONTACTS IN THE MAIN FUEL CONTROL CABINET. PROVIDE FULL VOLTAGE STARTER WITH OVERCURRENT PROTECTION FOR THE MOTOR, AND OVERCURRENT PROTECTION FOR THE CONDUCTORS.
 - iv. STARTER SHALL INCORPORATE STAGING TIMERS TO APPLY THE FIELD VOLTAGES IN A SEQUENCE THAT WILL PREVENT INRUSH CURRENT OVERLOADING.
 - v. ALL AC MOTORS SHALL BE MOUNTED ON THE PUMPING SET AND THE FILTRATION SYSTEM SHALL BE POWERED SET. ALL POWER WIRING FROM THIS CABINET TO THE MOTORS ON THE SET SHALL BE FACTORY INSTALLED AND TESTED.
 - b. TWO (2) 3" DUPLEX FUEL OIL STRAINERS FOR THE SUCTION SIDE OF EACH PUMP, SIZED TO PRODUCE LESS THAN 0.5 INCHES MERCURY DROP WITH THE MAXIMUM ANTICIPATED FLOW. EACH SUCTION LINE STRAINER SHALL HAVE ONE PIECE CAST-IRON BODY AND SHALL BE SUITABLE FOR PRESSURE TO 200 PSI. STRAINER BASKETS TO BE FABRICATED OF 100 MESH STAINLESS STEEL CLOTH AND TO COME COMPLETE WITH LEVER WRENCH HANDLE. STRAINER SHALL BE EQUAL TO PREFERRED UTILITIES MODEL NO. 50.
 - c. TWO (2) FUEL OIL PUMP RELIEF VALVES WITH AN ADJUSTABLE RANGE OF 75 TO 300 PSIG SET AT 100 PSIG. VALVES SHALL BE SIZED TO RELIEVE THE FULL FLOW OF THE PUMP WITHOUT CAUSING THE PUMP MOTOR TO OVERLOAD OR ANY COMPONENT'S PRESSURE RATING TO BE EXCEEDED IF THE DISCHARGE IS INADEQUATELY VALVED OFF. RELIEF VALVES SHALL BE EQUAL TO PREFERRED UTILITIES TYPE "R".
 - d. TWO (2) BRONZE BODY SWING TYPE CHECK VALVES WITH RE-GRINDABLE SEATS ON DISCHARGE SIDE OF EACH PUMP.
 - e. FOUR (4) FULL PORTED BALL VALVES TO BE LOCATED ON SUCTION AND DISCHARGE SIDE OF EACH FUEL OIL PUMP. VALVES SHALL HAVE INTERLOCK SWITCHES AT EACH END OF TRAVEL FOR POSITION MONITORING BY THE MAIN CONTROL SYSTEM.
 - f. FOUR (4) 4" DIAL COMPOUND GAUGES, ONE ON EACH SIDE OF SUCTION STRAINER. GAUGES SHALL BE LIQUID FILLED TO DAMPEN PULSATION, WITH STAINLESS STEEL CASE, BRASS MOVEMENT, BRONZE BOUDDON TYPE AND SHALL BE FURNISHED WITH A PULSATION DAMPENING ORIFICE. GAUGES SHALL READ 30" VACUUM - 15 PSIG.
 - g. THREE (3) 4" DIAL PRESSURE GAUGES TO BE PLACED ON DISCHARGE SIDE OF EACH PUMP AND AT THE DISCHARGE OF THE PUMP SET. THE GAUGES SHALL BE LIQUID FILLED TO DAMPEN PULSATION, HAVE STAINLESS STEEL CASE, BRASS MOVEMENT, BRONZE BOUDDON TYPE AND SHALL BE FURNISHED WITH A PULSATION DAMPENING ORIFICE. GAUGES SHALL READ 0-200 PSIG. ALL GAUGES SHALL BE INSTALLED WITH ISOLATION VALVES TO PERMIT REPLACEMENT AND CALIBRATION.
 - h. PUMPS AND MOTORS SHALL BE MOUNTED ON STRUCTURAL STEEL CHANNELS AND EQUIPPED WITH FLEXIBLE COUPLINGS AND FULL COUPLING GUARDS. PUMPS AND MOTORS SHALL BE MOUNTED WITH BOLTS THREADED INTO THE STEEL CHANNEL FOR EASE OF MAINTENANCE. MOUNTING BOLTS SHALL NOT PENETRATE THE SECONDARY CONTAINMENT BASIN.
 - i. PUMP SET BASE SHALL FORM A 2-3/4" DEEP SECONDARY CONTAINMENT BASIN TO CONTAIN ANY LEAKS FROM PUMPS, VALVES, FITTINGS, ETC. PUMP AND MOTOR ASSEMBLIES SHALL BE MOUNTED HIGH ENOUGH SO THAT THEY WILL BE UNAFFECTED BY ANY CONTAMINATION IN THE EVENT OF A LEAK.
 - j. A LEVEL SENSOR SHALL BE MOUNTED IN THE SECONDARY CONTAINMENT AREA TO SHUT OFF THE PUMPS AND ENERGIZE AN AUDIBLE AND VISUAL ALARM SHOULD A LEAK BE DETECTED. THE LEVEL SENSOR SHALL BE PROTECTED WITH A STEEL PLATE ENCLOSURE ON THE TOP AND THREE SIZES TO PREVENT DAMAGE TO THE FLOAT AND TO ENSURE FREEDOM OF MOVEMENT. LEVEL SENSOR SHALL BE PREFERRED UTILITIES MODEL PSS-WM.
5. DIFFERENTIAL PRESSURE SWITCHES SHALL BE PIPED FROM THE INLET TO THE OUTLET OF EACH PUMP TO PROVIDE A "PUMP IN OPERATION" SIGNAL TO THE CONTROL SYSTEM.
6. DIFFERENTIAL PRESSURE SWITCHES SHALL BE PIPED FROM THE INLET TO THE OUTLET OF EACH STRAINER TO PROVIDE A "STRAINER DIRTY" SIGNAL TO THE CONTROL SYSTEM.
7. A FLOW SWITCH SHALL BE PROVIDED IN THE COMMON DISCHARGE OF THE SET TO INDICATE THAT FLOW FROM THE SYSTEM HAS BEEN ESTABLISHED.
8. THE PUMPS SHALL BE CONNECTED TO THE PIPING IN THE SET THROUGH STAINLESS STEEL FLEX HOSES WITH BRAIDED JACKETS, AND THE PUMP AND MOTOR ASSEMBLIES SHALL BE MOUNTED TO THE BASE PLATE VIA ELASTOMERIC VIBRATION ISOLATORS.
9. PUMP SET SHALL BE EQUAL TO PREFERRED UTILITIES MODEL LO-1800-100-NH4.
10. FILTRATION, DETERAVENTING AND FUEL STABILIZATION SYSTEM

